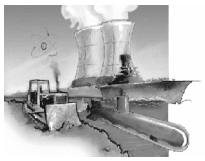
Research and Development of an Innovative Fossil Fuel Fired Vitrification Technology

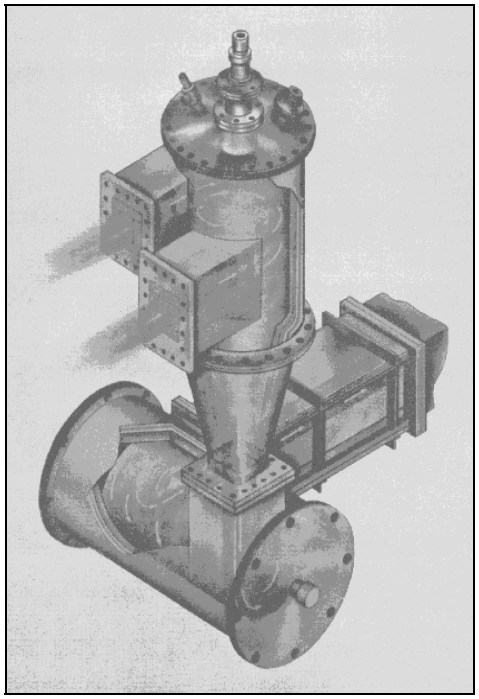


Developer: Vortec Corporation
Contract Number: DE-AC21-92MC29120
Crosscutting Area: N/A

Mixed Waste FOCUS AREA

Problem:

Cost-effective technologies for soil remediation are required to meet DOE's environmental remediation commitments for very large quantities of contaminated soils.



Solution:

An innovative fossil fuel fired vitrification process for remediation of soils containing hazardous and/or radioactive constituents is being developed. This process is an extension of an advanced, multifuel-capable, combustion and melting technology being developed for commercial glass manufacturing and waste processing/recycling with funding support from DOE and the EPA. The unique features of this technology provide the potential for a cost-effective, environmentally safe process for the vitrification of soils, sediments, sludges, and mill tailings containing organic, metallic, or radioactive contaminants.

Benefits:

- Multifuel capability
- High thermal efficiency
- Operational flexibility in terms of reduced start-up and shutdown
- Effective oxidation of organic contaminants in the feedstock
- Flexibility in effectively processing a wide variety of contaminated soils, sludges, and other hazardous waste materials
- Ability to produce glass products which effectively immobilize heavy metals and radionuclides
- Low capital and operating/maintenance costs
- Reduction of health and environmental risks

Technology:

The focus of research to date on the proposed technology has been the vitrification of waste materials in the form of dry granulated materials. The technology has demonstrated, through sub-scale subsystem testing, its ability to effectively vitrify potentially hazardous materials containing heavy metals and organic compounds. Materials with average particle size of up to 600 microns have been vitrified.

For soil remediation applications, it is desirable both economically and environmentally to minimize the soil comminution requirements. An additional issue that needs to be addressed for each application is finding the appropriate additive for effective vitrification of contaminated soils found at DOE sites. The ability of the technology to produce a vitrified product providing long-term immobilization of contaminants is dependent on the

distribution of glass formers and fluxes in the feed material.

Due to the high temperature required to effectively oxidize some organic materials and to vitrify inorganic materials in the proposed technology, a portion of any low-temperature volatile material, such as heavy metals, contained in contaminated soils will vaporize and be carried over into the flue gas from the process. The design of air pollution control subsystems to meet regulations will depend on the physical and chemical characteristics of the pollutants. Therefore, significant issues that need to be addressed in the project also include not only the destruction and removal efficiency level that the technology can achieve for the principal organic hazardous constituents in contaminated soils likely to be found at DOE sites, but also the quantity and chemical composition of the gaseous and particulate carryover and the size distribution of the particulate carryover during vitrification.

This project is planned in three phases. Phase I included the identification of the physical and chemical properties of soils likely to require remediation at DOE sites, development of a synthetic soil with surrogate contaminants and vitrification additives, performance testing on an existing 15-20 tons/day combustion and melting system test facility, development of a conceptual design of a sub-scale integrated system, and identification of the Paducah Gaseous Diffusion Plant in Paducah, KY as the location of the planned demonstration of a 25 ton/day integrated test facility. In Phase II, sub-scale soil testing continued to determine the proper refractory to withstand the corrosive, high-temperature environment; the demonstration plant was designed to process the selected Paducah waste streams, and a Technology Demonstration Plan was written with input from Paducah personnel. Phase III will consist of the building and integrated testing of the 25 demonstration plants.

Contacts:

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DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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